PROC. ENTOMOL. SOC. WASH.
99(1), 1997, pp. 156–161

A NEW SPECIES OF THE NEOTROPICAL GENUS *LISSOSCARTA* STÅL (HOMOPTERA: CICADELLIDAE: CICADELLINAE) THAT MIMICS WASPS

Gabriel Mejdalani and Márcio Felix

Departamento de Zoologia, Instituto de Biologia, Universidade Federal do Rio de Janeiro, Caixa Postal 68044, 21944-970 Rio de Janeiro RJ, Brasil.

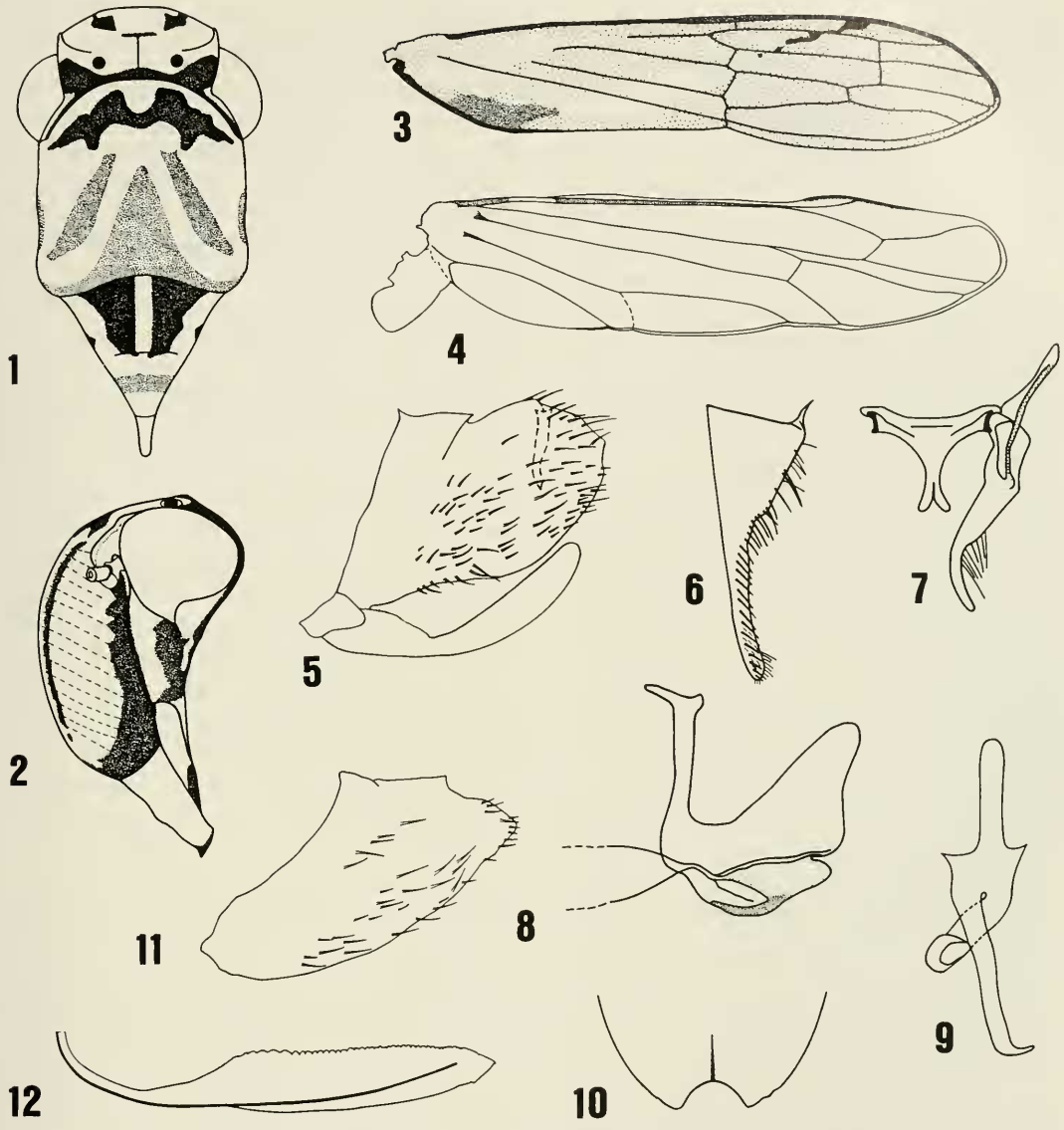
Abstract.—***Lissoscarta beckeri*, new species**, a leafhopper that mimics wasps, is described from the states of Rondônia and Mato Grosso, Brazil. The new species can be distinguished from the other species of the genus by the following features: males with an elongate dorsoapical process in pygofer; aedeagus with a conspicuous dorsal lobe and without processes; paraphyses arched dorsally; abdominal sternum VII of females with a concavity on posterior margin. All members of the genus *Lissoscarta* have a strong constriction at the base of the abdomen, the forewings completely hyaline, and the form of the pronotum similar to the mesoscutum of a wasp. The size and color are similar to those of wasps of the tribe Polybiini (Vespidae: Polistinae). Morphological comparisons and field observations suggested that at least six species in four different genera of that tribe could be models for *L. beckeri*.

Key Words: Cicadellidae, *Lissoscarta*, new species, mimicry, wasps

Six valid species of the Neotropical genus *Lissoscarta* Stål were recorded by Young (1977). The type species of the genus, *L. vespiformis* (Fabricius, 1803), has morphological and behavioral characters that enable it to mimic wasps (Evans 1947, Boulard 1978). The resemblance between *L. vespiformis* and wasps was first noted by Fabricius (1803) in the original description of the species (as *Cicada vespiformis*). The abdomen is strongly constricted at the base, the forewings are completely hyaline, and the form of the pronotum is similar to the mesoscutum of a wasp. When threatened, this leafhopper spreads its wings in a similar way to that of a wasp in the resting position, showing the constriction at the base of the abdomen. This behavior, in which the mimic suddenly exposes characteristics that resemble those of its model, is called "ostensible mimicry" (Boulard 1978). It is not found in any other known leafhopper genus. All the remaining species of *Lissoscarta* have the morphological features just mentioned (Young 1977), suggesting that "ostensible mimicry" is a characteristic of the genus. Unfortunately, no behavioral data are available for these other species.

In the present paper a new species of *Lissoscarta* from Brazil is described. Morphological comparisons, as well as field observations (J. Becker, personal communication), suggested that wasps of the tribe Polybiini (Vespidae, Polistinae) could be models for the new species. The characters supporting this view are discussed below.

Acronyms for collections in which the specimens used in this study are deposited are as follows: DZUP (Departamento de Zoologia da Universidade Federal do Paraná, Curitiba, Brazil), MNRJ (Museu Nacional do Rio de Janeiro, Rio de Janeiro, Brazil), and MZSP (Museu de Zoologia da



Figs. 1–12. *Lissoscarta beckeri*. 1, Head and thorax, dorsal view. 2, Head, lateral view. 3, Right forewing. 4, Right hindwing. 5–9, Male genitalia. 5, Pygofer and subgenital plate, lateral view. 6, Subgenital plate, ventral view. 7, Right style and connective, dorsal view. 8, Aedeagus, lateral view. 9, Paraphyses, dorsal view. 10–12, Female. 10, Abdominal sternum VII, ventral view. 11, Pygofer, lateral view. 12, Second valvula of ovipositor, lateral view.

Universidade de São Paulo, São Paulo, Brazil). In quotations of label data, a virgule (/) separates lines on a label and a semicolon separates information on different labels. Morphological terminology follows mainly Young (1977), excepting that of wing veins, which follows Dworakowska (1988). Nomenclature of wasp species follows Richards (1978) with modifications introduced by Carpenter and Day (1988).

Lissoscarta beckeri Mejdalani and Felix, new species

(Figs. 1–13)

Diagnosis.—*Lissoscarta beckeri* can be distinguished from the other species of the

genus by the following features: males with dorsoapical margin of pygofer with elongate process extending ventrally; aedeagus with conspicuous dorsal lobe, without processes; rami of paraphyses arched dorsally; females with abdominal sternum VII with median concavity on posterior margin.

Description.—Length of male 14.8–16.0 mm; female 16.6–16.8 mm. Surface of pronotum convex in dorsal view, with sulcus near anterior margin. Forewing (Fig. 3) elongate, completely hyaline. Hindwing (Fig. 4) strongly narrowed, with slightly enlarged jugal lobe, vein AP' greatly reduced and AP'' + JA absent. Abdomen (Fig. 13) strongly constricted at base between segments III and IV. Remaining morphological characters of head and thorax as in the generic description of Young (1977: 148).

Color: Crown, pronotum and scutellum yellow. Crown (Fig. 1) with inconspicuous transverse brown line at apex of coronal suture, anterior margin with pair of black spots, posterior margin with sinuate transverse black stripe. Pronotum (Fig. 1) with sinuate transverse black stripe on anterior margin, median and posterior portions with elongate brown spot on each side of larger triangular brown spot, lateral margins with elongate brown spot. Mesonotum (Fig. 1) with pair of conspicuous black maculae extending from base to scutellar suture, basilateral margins with small black spot, scutellum with transverse dark brown stripe. Forewing (Fig. 3) with fumose area extending from near base of anal margin caudolaterally across clavus and becoming diffuse in corium. Hindwing with most of ScP + R + MA yellow. Face yellow. Clypeus (Fig. 2) with lateral and ventral margins black and with pair of longitudinal black stripes on muscle impressions extending to apical spots of crown. Clypellus (Fig. 2) with blackish apex. Lora (Fig. 2) with black spot on inferior portion. Genae (Fig. 2) with black spot below eyes, dorsoposterior margin black. Thoracic sterna yellow. Anterior tibiae brown, with black stripe along ventral margin. Abdomen (Fig. 13) with tergites yellowish-brown, posterior margins with transverse yellow stripe.

Male genitalia (Figs. 5–9): Pygofer (Fig. 5) moderately produced in lateral view, with posterior margin convex; with macrosetae numerous, lacking only on basidorsal area; dorsoapical margin with elongate process extending ventrally. Subgenital plates (Figs. 5, 6) in ventral view elongate, triangular, extending posteriorly almost as far as pygofer apex; with uniseriate macrosetae; microsetae also present. Style (Fig. 7) extending posteriorly considerably beyond apex of connective, without preapical lobe; preapical area with group of setae; apex rounded. Connective (Fig. 7) T-shaped. Aedeagus (Fig. 8) symmetrical, with conspicuous dorsal lobe in lateral view; ventral margin with longitudinal sulcus. Paraphyses (Fig. 9) with pair of asymmetrical rami directed dorsally.

Female genitalia (Figs. 10–12): Abdominal sternum VII (Fig. 10) broad in ventral view, with median concavity on posterior margin. Pygofer (Fig. 11) well produced in lateral view, triangular, with apex narrowly rounded; most macrosetae on apex and extending anteriorly along ventral margin, small number below dorsal margin. Second valvulae of ovipositor (Fig. 12) expanded beyond basal curvature, preapical prominence discrete, apex acute; shaft bearing teeth throughout expanded portion, except on apical area, teeth quadrate, sloping and bearing minute secondaries, apex with numerous denticles on dorsal and ventral margins.

Type material.—Holotype: ♂, Brazil, "Ouro Preto/ d'Oeste-RO/ 21-X-1986/ J. Becker col.", MNRJ. Paratypes: One ♂, one ♀, same data as holotype, MNRJ. One ♂, "Pimenta Bueno-RO/ 23-X-1986/ J. Becker col.", MNRJ. One ♂, one ♀, "Vila Vera MT/ Brasil X-1973/ M. Alvarenga Leg", DZUP.

Additional material.—Dr. M. W. Nielson (Brigham Young University, Utah, U.S.A.) identified, using a manuscript of our paper, eight specimens of *L. beckeri* in the collec-

tion of the Utah State University. He has kindly sent us the information on the labels of these specimens: "One ♂, one ♀, Brazil: Rondonia, 62 mi. SE Ariquemes, 15–22 March 1991, W. Hanson, G. Bohart; two ♂, one ♀, same data as above except 13–25 April 1992, W. J. Hanson; one ♂, two ♀, same data as above except 17–24 May 1989, 180 m, W. J. Hanson."

Notes.—This species keys to *Lissoscarta vespiformis* in Young's (1977) key. The convex posterior margin of the pygofer (Fig. 5) and the conspicuous dorsal aedeagal lobe (Fig. 8) of *L. beckeri* are similar to those of *L. vespiformis*, but the latter does not have pygofer processes and the rami of its paraphyses are more symmetrical; the posterior margin of female abdominal sternum VII (Fig. 10) is distinctly concave in *L. beckeri* and only slightly emarginate in *L. vespiformis*. The unpaired dorsal aedeagal processes of *L. schlingeri* Young, *L. pereneensis* Young, *L. catutara* Young, and *L. nipata* Young will readily distinguish them from *L. beckeri*; in *L. catutara* the posterior margin of female sternum VII is also only slightly emarginate. *Lissoscarta pebasensis* Young is known only from the holotype female (Young 1977); the abdominal sternum VII of this species has a regularly convex posterior margin that distinguishes it from *L. beckeri*. The new species is named in honor of Prof. Johann Becker (Museu Nacional, Rio de Janeiro), who has collected many interesting Homoptera in Brazil.

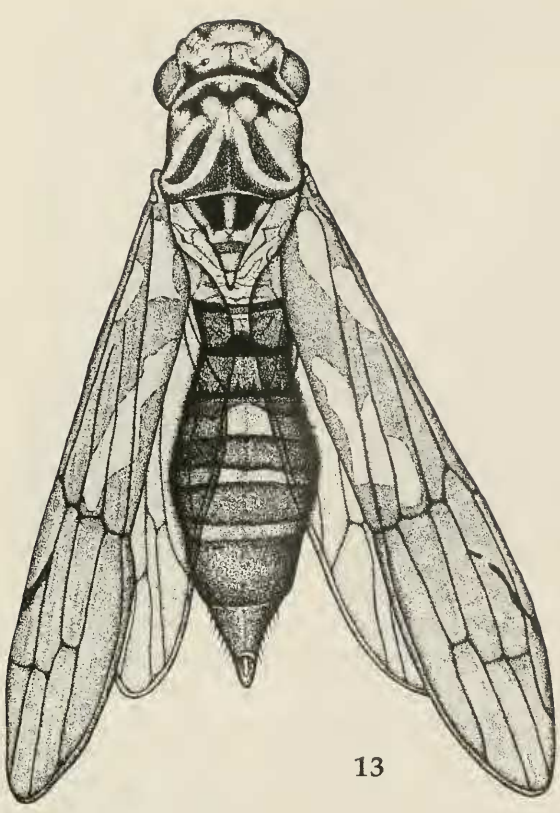
Discussion

We have studied wasp species belonging to four genera of the tribe Polybiini: *Agelaia* Lepeletier [*A. fulvofasciata* (Degeer), *A. flavipennis* (Ducke), and *A. hamiltoni* (Richards)], *Pseudopolybia* Saussure [*P. difficilis* (Ducke)], *Polybia* Lepeletier [*P.* (*Pedothoeca*) *emaciata* Lucas], and *Mischocyttarus* Saussure [*M.* (*Haplometrobius*) *undulatus* (Ducke)]. The specimens examined are deposited either in MNRJ or MZSP and were determined by O. W. Richards, excepting a single specimen of *A. fulvofasciata* from the type locality of *L. beckeri*, which was identified by the authors. These species are very similar in terms of color pattern, a fact indicating that they are part of a group of Müllerian mimics. The head and thorax in all of them are yellow, being similarly marked by dark spots and stripes. The abdominal tergites are yellowish-brown and often present a yellow transverse stripe at posterior margin.

The features mentioned above, which are here exemplified by *A. fulvofasciata* (Fig. 14), are mimicked by *L. beckeri* (Fig. 13). This represents a case of Batesian mimicry. The presence of dark spots and stripes on the head and thorax of the leafhopper, as well as the transverse yellow stripes at the posterior margin of the abdominal tergites, are remarkable characters. All wasps studied occur within the geographical range of *L. beckeri* (see Richards 1978). They are approximately the same size as the mimic.

In terms of morphology, the constriction at the base of the abdomen of *L. beckeri* is an important character (Fig. 13). This constriction mimics the constricted zone (petiole) at the base of the abdomen of the wasps. The fore- (Fig. 3) and hindwings (Fig. 4) of *L. beckeri* are hyaline, resembling those of the polybiines mentioned. The hindwings are also strongly narrowed, having a form very different from that usually found in other members of the subfamily Cicadellinae. The vein AP′ is greatly reduced and AP″ + JA is absent. The convex pronotum of *L. beckeri* mimics the mesoscutum of the wasps.

Agelaia fulvofasciata (Degeer) is a model for *L. beckeri* in the type locality of the latter. It is apparently more common than the leafhopper (J. Becker, personal communication). Becker also observed that *L. beckeri* can rest upon the leaves with its wings spread in wasp-like manner. This behavior is similar to the "bluffing display" described by Boulard (1978) for *L. vespiformis*. In agreement with its wide range, commonness and aggressive behavior, *A.*



Figs. 13–14. 13, *Lissoscarta beckeri*, dorsal habitus of female. 14, *Agelaia fulvofasciata*, a model of *Lissoscarta beckeri*, dorsal habitus of female.

fulvofasciata is mimicked by many species of wasps and other insects (Richards 1978). Indeed, Richards and Richards (1951) observed that it is also a model for *L. vespiformis*.

Using Vane-Wright's (1976) terminology and analytic schemes, this case of mimicry would be Class VI (antergic defensive). This class includes Bates' original formulation of mimicry (Vane-Wright 1976). The predators (operators) from which such mimicry affords protection are unknown. Therefore, it is not possible to establish whether this mimicry is disjunct (mimic, model, and operator are different species) or bipolar (model and operator are the same). More field observations are necessary to settle this question. At least two other cases of antergic defensive mimicry have been reported in Homoptera. Hogue (1984) speculated that lanternflies (*Fulgora* spp.) avoid predation by mimicking arboreal lizards. Zolnerowich (1992) described a nymph of *Amycle* sp. (Fulgoridae) that mimics jumping spiders (Salticidae). In these two cases the model and operator were considered the same (bipolar).

Acknowledgments

We are grateful to J. Becker (MNRJ) for making available for study specimens under his care and for providing invaluable information about mimicry in *L. beckeri*. We also thank the following persons for lending specimens of *Lissoscarta*: R. R. Cavichioli (DZUP), M. D. Webb (The Natural History Museum, London), and U. R. Martins (MZSP). C. R. Brandão (MZSP) helped a

great deal with the identification of *A. fulvofasciata* and made available for study wasps under his care. The habitus drawings of *L. beckeri* and *A. fulvofasciata* were inked by M. F. Pessôa. The manuscript benefited from the comments of J. Becker, F. A. Bockmann, A. L. Carvalho, C. H. Dietrich, L. F. Dorvillé, W. J. Knight, J. L. Nessimian, M. W. Nielson, E. R. da-Silva, M. D. Webb, and two anonymous reviewers.

Literature Cited

Boulard, M. 1978. Premier cas de "mimétisme ostensible" chez les Homoptères Auchénorhynques (Insecta). Compte Rendu Hebdomadaire des Séances de l'Academie des Sciences 287 (D): 1389–1391.

Carpenter, J. M. and M. C. Day. 1988. Nomenclatural notes on Polistinae (Hymenoptera: Vespidae). Proceedings of the Entomological Society of Washington 90: 323–328.

Dworakowska, I. 1988. Main veins of the wings of Auchenorrhyncha (Insecta, Rhynchota: Hemelytrata). Entomologische Abhandlungen aus dem Staatlichen Museum für Tierkunde in Dresden 52: 63–108.

Evans, J. W. 1947. A natural classification of leafhoppers (Jassoidea, Homoptera). Part 3: Jassidae. Transactions of the Royal Entomological Society of London 98: 105–271.

Fabricius, J. C. 1803. Systema Rhyngotorum secundum Ordines, Genera, Species adiectis Synonymis, Locis, Observationibus, Descriptionibus. Apud Carolum Reichard. Brunswick. 314 pp.

Hogue, C. L. 1984. Observations on the plant hosts and possible mimicry models of "Lantern Bugs" (*Fulgora* spp.) (Homoptera: Fulgoridae). Revista de Biologia Tropical 32: 145–150.

Richards, O. W. 1978. The social wasps of the Americas excluding the Vespinae. British Museum (Natural History). London. 580 pp. + 4 pls.

Richards, O. W. and M. J. Richards. 1951. Observations on the social wasps of South America (Hymenoptera Vespidae). Transactions of the Royal Entomological Society of London 102: 1–169 + I–IV pls.

Vane-Wright, R. I. 1976. A unified classification of mimetic resemblances. Biological Journal of the Linnean Society of London 8: 25–56.

Young, D. A. 1977. Taxonomic study of the Cicadellinae (Homoptera: Cicadellidae). Part 2. New World Cicadellini and the genus *Cicadella*. North Carolina Agricultural Experiment Station Technical Bulletin 239: 1–1135.

Zolnerowich, G. 1992. A unique *Amycle* nymph (Homoptera: Fulgoridae) that mimics jumping spiders (Araneae: Salticidae). Journal of the New York Entomological Society 100: 498–502.